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Art. XVI.—*A Note on the Physiography of the Woori Yallock Basin.*

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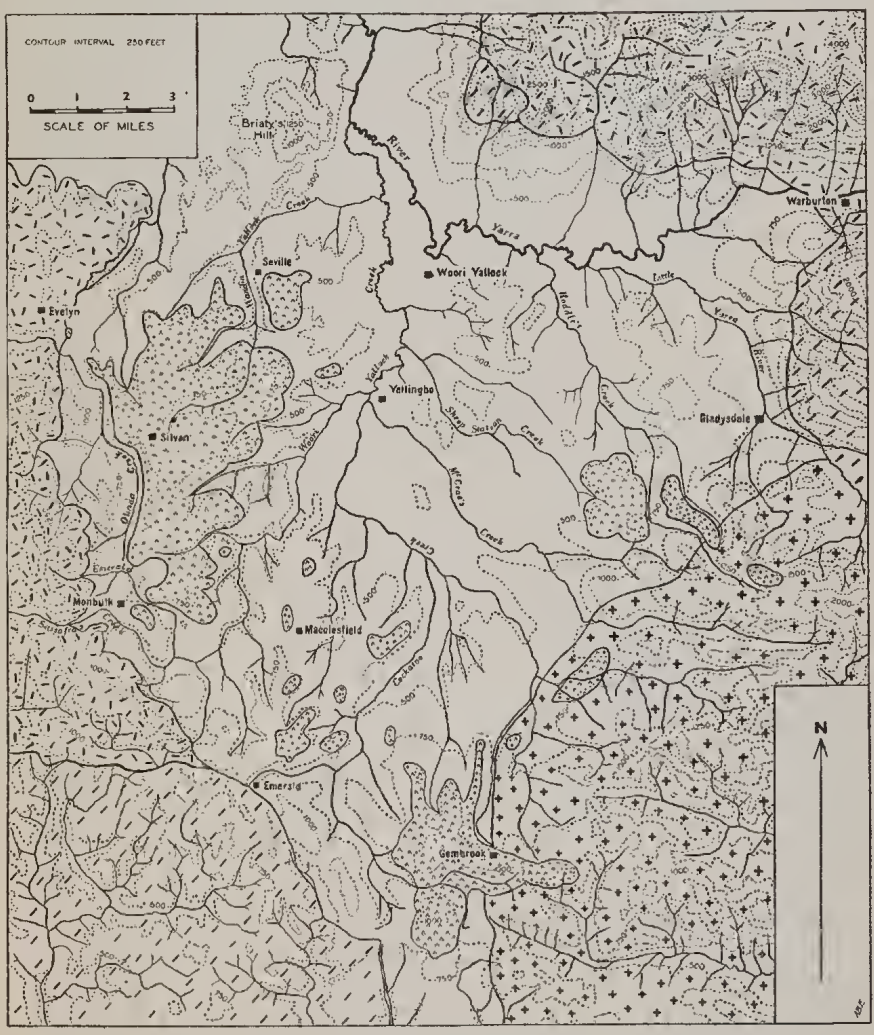
Introduction.

The term Woori Yallock Basin appears to have been coined by Gregory (1903) to describe the relatively low-level area that lies between the Dandenong Ranges, on the west, and the Powelltown Ranges on the east (fig. 1). This area encloses the drainage system of the Woori Yallock Creek, Hoddle's Creek, and the Little Yarra River. It is a topographic basin due to differential erosion, and not a structural one. The floor of the Basin is composed of Silurian mudstones and shales that have been eroded much more easily than the igneous rocks of the Dandenong Ranges or the porphyritic granite of the Powelltown Ranges. The outlet is to the north, to the Yarra Valley, while at the southern end the Basin is closed by a narrow pass, at about 1,000 feet above sea-level, between the converging walls of igneous rock.

Structurally the area has the form of an anticlinal dome (dome in the sense of Thomas, 1939, p. 59), since Melbournian beds occur near Macclesfield, about the centre of the Basin (E. Gill: personal communication), while Yeringian beds occur to the north-east, north, north-west, west, and south-west (Gill, 1939).

In (?) Oligocene times the main valleys across the floor of the Basin were infilled with basaltic lava flows of the Older Volcanic Series, and the drainage reconstituted itself as a series of lateral streams more or less parallel to the pre-basaltic stream courses, and flowing to the north. Erosion of the basalts has progressed until now they occur only as residuals capping the ridges between the valleys. The geological boundaries have been mapped by Easton (1908), and the geology of Figure 1 is based upon his map, while the contours are taken from the Ringwood Sheet of the Military Survey, and the western sheet of the Boy Scout Jamboree Map of 1935. It will be seen that at present the floor of the Basin consists of a series of narrow, sub-parallel ridges, with undulating crests, converging towards the north, and separated by somewhat wider valleys up to 200 feet deep. These valleys and ridges trend at right angles to the walls of the Basin so that over the Basin as a whole their arrangement approximates to a fan-pattern.


CONTOUR INTERVAL 250 FEET
0 1 2 3
SCALE OF MILES
Briarly's Hill
Yarra River
Warburton
Seville
Woori Yallock
Evelyn
Yellingbo
Gladysdale
Silvan
Monbulk
Macclesfield
Emerald
Gembrook
N
SILURIAN SEDIMENTS
DEVONIAN DACITES
DEVONIAN GRANODIORITE
DEVONIAN GRANITE
TERTIARY BASALT

Previous Observations.

It has been suggested by Gregory (1903), and by Keble (1918), that the pre-Older Volcanic streams in this Basin flowed southwards, through the low pass near Gembrook, to the Koo-wee-rup Swamp; and not northwards to join the Yarra as they do at present. Gregory offered no explanation of the reversal of the drainage from this postulated south-flowing system to the present system other than a very general reference to stream capture; but Keble explained it as due to a retardation of drainage through the "Gembrook bottle-neck" caused by the resistant nature both of the basalt which had infilled the valley at this point, and of the wall rocks of the valley. Such retardation, he suggests, slowed up the development of the system further upstream, and rendered it an easy capture to adjoining river systems.

If this conception of the pre-basaltic streams flowing southwards through the Woori Yallock Basin was correct, the whole of the land north of the Gembrook Pass forming their catchment must have been at a higher level than the level of the Pass at the time when the basalts were extruded. The same volume of water as previously would have found its way through the "bottle-neck" after a short period of lake formation; and despite Keble's suggestion that the lava flows "converged" on this point, there is nothing to indicate that the thickness of basalt at Gembrook is, or was, very materially greater than elsewhere within the Basin. This being so, the rejuvenated drainage of the Basin would have readily breached the lava flow in the "bottle-neck", after which, by undercutting the basalt, it would have established a valley in which it could cut down to the pre-basaltic level, and so, apart from other considerations, make unlikely such an extensive reversion of drainage as visualized by Keble. Moreover, it must be remembered that the adjoining river system—namely, the Yarra System—had also suffered retardation at this time, owing probably to the extrusion of basalt across its valley at Lilydale, and was developing, in the Yarra Valley, extensive river flats which even now are not undergoing erosion (Hills, 1934, p. 169). There are, therefore, grounds for thinking that if there had been a south-flowing drainage system in the Woori Yallock Basin prior to the Older Volcanic eruptions, such a system would continue to exist.

Gregory's Evidence (1903).

Gregory seems to have based his belief in the existence of this south-flowing river system on the following observation (Gregory, 1903, p. 107):—

"Looking across the Woori Yallock Basin (from Mt. Dandenong) to the hills that form its eastern border, we see that

they form a long range sloping to the south; the hill crest is here and there notched and irregular; but a line joining the points on the range has a steady southward slope."

From this he concludes that "at one time this country must have been part of a peneplain with a slope to the south; down this slope rivers flowed at right angles to the course now followed by the Yarra. Remains of the valleys of these older rivers are well marked; thus, the ridge that forms the main watershed of Victoria (the Main Divide) is notched by a river-cut depression —the Kinglake Gap, north of Yarra Glen; and the divide between the Yarra and the rivers of Gippsland is notched by a similar depression east of Gembrook—the Beenak Gap—connecting the basin of Woori Yallock and the Koo-wee-rup Swamp".

Gregory's belief that the dacites and other volcanic rocks of the Dandenong Ranges and the Warburton Ranges were of early Tertiary age "formed at the beginning of the great series of eruptions which ended in the formation of the great basalt plains of Victoria" (Gregory, 1902, p. 213), no doubt caused him to overlook the significance of the difference between the level profile of the Warburton Ranges and the sloping profile of the Powelltown granite massif. This only became apparent after Skeats (1910*a*) had demonstrated the Devonian age of the dacites, when he (1910*b*, p. 188) suggested that "the level-topped, plateau-like character of the dacites" represented "remnants of a former extensive peneplain developed by long-continued subaerial denudation of the igneous and sedimentary rocks before Mid-Kainozoic times", and that subsequent uplift had "led to the dissection of this peneplain and the formation of another at a level of only a few hundred feet above sea-level, the softer sediments being easily base-levelled, and the more resistant dacites preserving remnants of the older peneplain". Hills (1934, p. 160) advances reasons for considering that this older peneplain is of Cretaceous age.

This being so, the true surface of the old peneplain is indicated by the level profile of the Warburton Ranges; while the south sloping surface of the distinctly lower Powelltown Ranges is simply the profile of the present erosion surface on those ranges, and since the granites which form them were probably not exposed at the surface in Cretaceous time, it affords no evidence as to the direction that post-Cretaceous streams would have taken through the Woori Yallock Basin. All that we can determine concerning these is that they must have been determined largely by the positions of the resistant dacite areas. The streams would, therefore, have developed mainly in the softer areas of sedimentary rocks between the dacite areas, much as they are now, and might in this way have become super-imposed on the deeper-seated granites which were probably not exposed at that time.

Keble's Evidence (1918).

Keble's conclusion was based upon his study of lava residuals, particularly those of the Woori Yallock Basin, which, on an uncontoured map, give the appearance of convergence towards Gembrook. Thus he states (p. 158):—

"A large tributary of this last-mentioned stream had its source somewhere north of the Woori Yallock residual, and was probably identical in its headwaters with the Watts. Its course is represented by the 'uncovered residual' of Steel's Range, the Woori Yallock residual, the Gembrook residual, the Pakenham residual, and by a line of conspicuous uncovered residuals disappearing into the Koo-wee-rup fault block towards the trunk stream. Above the Gembrook bottleneck this tributary received a tributary from the north-east; it originated on the westerly slope of Mt. Donna Buang."

When this statement is examined in detail, a number of facts appear which are irreconcilable with the general picture. Thus—

1. Steel's Range (Briaty's Hill), as indicated by Hills (1934, p. 168), owes its prominence to the fact that it is composed of silicified sandstones, more resistant to erosion than the adjacent Silurian sediments. It cannot, therefore, be an "uncovered residual", i.e., the floor of a pre-basaltic valley.

2. The basalt residuals along the upper part of Hoddle's Creek descend successively from 1,500 feet above sea-level to 1,300 feet and 750 feet, going towards the north-west, and Hoddle's Creek and Sheep Station Creek, which also flow in a general north-westerly direction, appear to be laterals of the flow represented by these residuals.

3. The line of basalt residuals extending from near Emerald to north of Macclesfield descends from about 950 feet at the southernmost residual to about 700 feet at the northernmost—a fall of 250 feet in 4 miles. The levels refer to the relatively flat tops of the residuals, since the bases are obscured by soil creep. Moreover, the Woori Yallock Creek and the Cockatoo Creek–Macclesfield Creek have formed as north-flowing laterals to this lava flow, and indicate its northward extension—now marked by an "uncovered residual"—to near Yellingbo, where they junction.

4. At Gembrook the basalt residuals stand at 1,050 feet to 1,100 feet above sea-level, and fall away to the north (1,000 feet). The branch of Cockatoo Creek, which is a lateral to the Gembrook residual, rises south of the southernmost point of the basalt, and flows northwards from this point.

5. The large residual extending from Monbulk to just south of Seville, ranges in height from 950 feet to 700 feet above sea-level. The surface is somewhat irregular, being highest in the central portion near Silvan. It seems probable that this residual

represents not a "confined" lava field, as Keble suggested, but a local "extensive" lava field, infilling the valleys of several streams which rose in the Dandenong Ranges and trended eastwards or north-eastwards, and also covering the interfluves between them. Some of these streams, like Emerald Creek and Sassafras Creek, subsequently crossed and breached the basalt, and joined its eastern lateral, Woori Yallock Creek. Others, like Lyre Bird Creek and Olinda Creek, were ponded into a lake behind the lava flows, and found an escape over a low divide south-east of Evelyn, being thus enabled to form a western lateral to the basalt as the present Olinda Creek.

Conclusion.

From this brief discussion it will be seen that there is no reliable evidence to show that any stream ever flowed southwards via the Woori Yallock Basin towards Western Port Bay. On the other hand, the levels at which the remaining basaltic residuals occur strongly suggest that the pre-Older Volcanic streams, like the present ones, flowed to the north to join the Yarra River. The Gembrook Pass, on this view, is not a river-cut depression but simply a low pass in the divide, such as may be expected in any divide wherever a zone of soft rocks occurs interposed between resistant rocks.

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